

What is claimed is:

1. A magnetic recording medium comprising:

a substrate;

a magnetic layer; and

a carbon-containing overcoat having a thickness of about 150Å or less and comprising a first carbon density and a second carbon density different from the first carbon density,

wherein the magnetic recording medium does not contain a dielectric layer between the magnetic layer and the carbon-containing overcoat.
2. The magnetic recording medium of claim 1, wherein the carbon-containing overcoat, the first carbon density is about 1.8 g/cm³ or less, the second carbon density is higher than the first carbon density and the difference between the second carbon density and the first carbon density is at least about 0.025 g/cm³.
3. The magnetic recording medium of claim 1, wherein carbon-containing overcoat directly contacts the magnetic layer.
4. The magnetic recording medium of claim 1, wherein the first carbon density is a density selected from the group consisting of about 1.75 g/cm³ or less, 1.7 g/cm³ or less, 1.65 g/cm³ or less and 1.6 g/cm³ or less.

5. The magnetic recording medium of claim 1, wherein the second carbon density is a density selected from the group consisting of at least 1.8 g/cm^3 , of at least 1.85 g/cm^3 , of at least 1.9 g/cm^3 and of at least 1.95 g/cm^3 .
6. The magnetic recording medium of claim 1, wherein the first carbon density is at a distance of 30 \AA or less from a top surface of the magnetic layer.
7. The magnetic recording medium of claim 1, wherein the carbon-containing overcoat comprises a material selected from a group consisting of carbon, hydrogenated carbon, fluorinated carbon, nitrated carbon, amorphous carbon, amorphous hydrogenated carbon, amorphous fluorinated carbon, amorphous nitrated carbon and combinations thereof.
8. The magnetic recording medium of claim 1, wherein the carbon-containing overcoat comprises at least a first carbon layer and a second carbon layer, wherein the first carbon layer is closer to the magnetic layer and comprises the first carbon density.
9. The magnetic recording medium of claim 8, wherein the second carbon layer comprises the second carbon density, said second density being at least 1.8 g/cm^3 .
10. A method of making a magnetic recording medium comprising:
depositing a magnetic layer on a substrate;

depositing a first portion of a carbon-containing overcoat directly on the magnetic layer; and

depositing second portion of the carbon-containing overcoat under the following deposition condition:

$$Y \geq 0.7764 X^{0.5639}$$

wherein, Y is a thickness of the first portion of the carbon-containing overcoat and X is carbon ion energy per carbon atom in eV during said depositing second portion of the carbon-containing overcoat and

the carbon-containing overcoat comprises a first carbon density and a second carbon density different from the first carbon density.

11. The method of claim 10, wherein said depositing a carbon-containing overcoat comprises increasing the carbon ion energy as the thickness of the carbon-containing overcoat is increased.

12. The method of claim 10, wherein the carbon-containing overcoat has a thickness of about 150Å or less on the magnetic layer and the first carbon density is about 1.8 g/cm³ or less.

13. The method of claim 10, wherein the carbon ion energy is increased from a first range of less than 50 eV to a second range of more than 50 eV during said depositing a carbon-containing overcoat.

14. The method of claim 10, wherein the first carbon density is a density selected from the group consisting of about 1.75 g/cm^3 or less, 1.7 g/cm^3 or less, 1.65 g/cm^3 or less and 1.6 g/cm^3 or less.

15. The method of claim 10, wherein the second carbon density comprises a density selected from the group consisting of at least 1.8 g/cm^3 , of at least 1.85 g/cm^3 , of at least 1.9 g/cm^3 and of at least 1.95 g/cm^3 .

16. The method of claim 10, wherein the carbon-containing overcoat comprises at least a first carbon layer and a second carbon layer.

17. The method of claim 16, wherein the first carbon layer is closer to the magnetic layer than the second carbon and the first carbon layer is deposited using a sputtering process.

18. The method of claim 16, wherein the second carbon layer is on the first carbon layer and is deposited using a deposition process selected from the group consisting of plasma-enhanced chemical vapor deposition, ion beam deposition, and filtered cathodic arc deposition.

19. The method of claim 16, wherein the first carbon layer comprises a first carbon density and the second carbon layer comprises the second carbon density, the second carbon density being higher than the first carbon density.

20. A magnetic recording medium, comprising a magnetic layer and means for protecting the magnetic layer.